NAME Key JULY 30, 2018

Instructions: *Include all relevant work to get full credit. Write your solutions using proper notations. Encircle your final answers.*

Quiz #16

1. Use the substitution method to find the general antiderivative of the following: (*Make sure that your final answer is in terms of the original variable.*)

a. $\int xe^{x^2+1}\,dx$ $= \int e^u \left(\frac{1}{2}du\right) = \frac{1}{2}\int e^u\,du$ [2]

Let $u = x^2+1$ $= \frac{1}{2}e^u + C$

$du = 2x\,dx$ $= \frac{1}{2}e^{x^2+1} + C$

b. $\int 4x\sqrt[3]{x^2-3}\,dx$ $= \int 2\sqrt[3]{u}\,du = 2\int u^{1/3}\,du$ [2]

Let $u = x^2-3$ $= 2\frac{(u^{4/3})}{4/3} + C$

$du = 2x\,dx$

$= \frac{3}{2}(x^2-3)^{4/3} + C$

c. $\int \frac{3t^2-1}{t^3-t}\,dt$ $= \int \frac{1}{u}\,du = \ln|u| + C$ [2]

Let $u = t^3 - t$ $= \ln|t^3-t| + C$

$du = (3t^2-1)\,dt$

d. $\int \frac{\sec^2\theta}{\tan^2\theta}\,d\theta$ $= \int \frac{du}{u^2} = \int u^{-2}\,du = -u^{-1} + C$ [2]

Let $u = \tan\theta$ $= -\frac{1}{\tan\theta} + C$

$du = \sec^2\theta\,d\theta$

e. $\int 4x^3\sqrt[3]{x^2-3}\,dx$ $= \int 2x^2\sqrt[3]{x^2-3}\,(2x\,dx)$ [2]

Let $u = x^2-3$ $= \int 2(u+3)u^{1/3}\,du$

$du = 2x\,dx$

$x^2 = u+3$ $= \int 2u^{4/3} + 6u^{1/3}\,du$

$= \frac{2u^{7/3}}{7/3} + \frac{6u^{4/3}}{4/3} + C$

$= \frac{6}{7}(x^2-3)^{7/3} + \frac{9}{2}(x^2-3)^{4/3} + C$